Garage DCV System Case Study: Japan Center Garage, San Francisco

NES System Slashes Energy Consumption by More Than 1.2 Million kWh Per Year

The Property

The Japan Center Garage is the hub of San Francisco's Japantown. It was constructed in 1968, and it's divided into two, primary parking facilities:

Japan Center, San Francisco

- The Main Garage, which is a two-level, 235,000 square-foot structure; and
- The Annex Garage, a single-level, below-grade facility measuring 60,000 square feet.

At the time of construction, a combined total of 34 exhaust and supply fan-motor units were designed in to feed fresh air to the Main Garage, while the Annex Garage required a total of 11 units do the same.

Despite their advanced age, a good many of the exhaust and supply fans — 32 of the 34 in the Main Garage and all 11 in the Annex Garage — remained operable throughout the years. Garage management, however, chose to run the fan units on weekends only, to accommodate an increase in shopper traffic. Otherwise, management manually turned off the fan units on weekdays due to: a) the considerable operational expense incurred running them on a full-time basis; and b) the noise they generated.

The Operational Challenge

Recent updates to the California Energy Code (Title 24) obliged the San Francisco Municipal Transportation Agency (SFMTA) to upgrade the mechanical ventilation systems of some of the City's aging garages, including the Japan Center, Golden Gateway and Sutter Stockton garages.

The retrofit plan for the Japan Center's Main and Annex garages included the replacement (by third-party vendors) of 45, 5-horsepower (HP) fan-motor units — a combined 225 HP — with new, energy efficient units. City design plans also called for the installation of 45 ABB variable frequency drives (VFDs), with the Nagle Energy Solutions (NES) demand-control ventilation (DCV) system controlling — via the VFDs — the rate of ventilation based on carbon monoxide (CO) concentrations.

The NES system was selected by City mechanical design engineers based on its ability to:

- Meet the California Energy Code (Title 24) requirement to provide continuous ventilation during garage-occupied hours, which is designed to protect the health and safety of garage employees and patrons, as well as those who live and/or work above the space; and
- Minimize the energy consumed by the considerable amount of fan-motor HP required at Japan Center Garage (and the other City garages) to achieve the required maximum ventilation rate — 0.75 cubic feet per minute (cfm) — when carbon monoxide (CO) emissions rise to predetermined thresholds due to traffic in the garage.

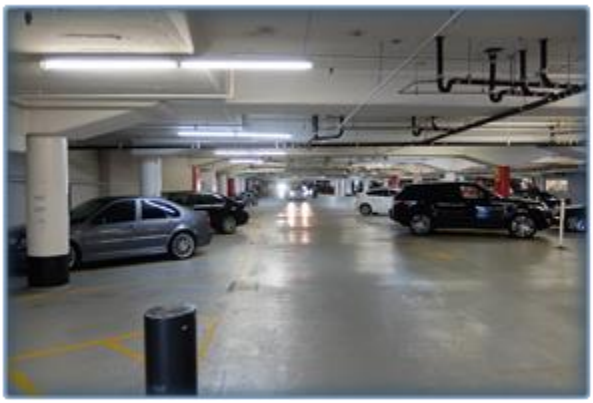
Energy Savings Opportunity

Pre-installation calculations showed that, with no means of controlling motors running 21 hours a day, seven (7) days a week, the Main Garage's newly installed mechanical ventilation system would consume more than 970,000 kilowatt-hours (kWh) per calendar year. The correlating annual peak kilowatt (kW) demand would amount to more than 125 kW. Calculations for the Annex Garage reflected a 19/7 runtime schedule consuming more than 280,000 kWh per year, with an annual peak kW demand amounting to more than 40kW.

The electric utility rate for both garages garage is $0.2056/kWh. As such, at the calculated rate of kWh consumption and no means of ventilation control in place, the annual cost to ventilate the Main and Annex garages would amount to $258,000 — not including future utility rate increases.

The NES Solution –

The NES Digital TR50 Series garage DCV system was installed in the Japan Center Main Garage and the NES Digital TR25 Series system was installed in the Annex Garage. The retrofit included the installation of 71 BACnet-communicating carbon monoxide (CO) sensors throughout the respective garages. The NES CO sensors provide instantaneous feedback to the NES controllers, which then relay speed commands (via the VFDs) to the garage's exhaust and supply fan motors, increasing and decreasing motor speeds based on CO concentrations at a given time. This approach, when deployed with proprietary NES controller sequencing, routinely captures kWh and peak kW demand savings in the range of 95% – and, in some instances, greater.



The Results –

Since commissioning the NES system in early March 2017, real-time monitoring / data logging at the Japan Center Garage shows the NES Garage DCV System is limiting the power (kW) consumption of the new fan motors to just 3% of their combined full-speed power (kW) draw. Indeed, the rate or percentage of savings at the garage – both for kWh consumption and peak kW demand — has remained at or fallen on the plus side of 97%.

Consumption	Without NES Controls	With NES TR50 & TR25	Savings	% Savings
Total kWh (Main & Annex Garages)	**1,253,689**	**37,610**	**1,216,079**	**97.0%**
Total Cost @ $0.2056/kWh	**$ 257,789**	**$ 7,734**	**$ 250,055**	**97.0%**
Total kW Demand	**166.18**	**4.99**	**161.19**	**97.0%**

Moving forward, the cost to ventilate the garage will amount to approximately $650 a month — versus $21,500 a month without the NES system.

Furthermore, according to property management, with 45 new garage-fan motors running an average of 20 hours a day, seven (7) days a week, the NES System actually has reduced the garage's baseline of energy consumption from the prior year — when 43 older fan units ran ***only*** on weekends. In fact, in the six-month window from the time NES commissioned its system(s) thru the end of August 2017, the Japan Center's overall energy consumption was cut by $2,635. That correlates to an annual energy cost savings of $5,270.

About Nagle Energy Solutions (NES)

Nagle Energy Solutions, LLC (www.nagle-energy.com) is a manufacturer, distributor and installer of an innovative demand-control ventilation (DCV) system for commercial garages that reduces energy consumption by an average of 95% — with quantifiable savings as high as 97% achieved — all while leaving your garage fan motors running. Our sales and service capabilities extend nationally.

The NES TR product line of controllers is designed to provide optimum functionality and system features, including scalability — custom designed according to customer requirements — and an "open" communications platform that comports with many BMS and/or EMS communication protocols. Moreover, NES TR controllers integrate a web server that enables building owners / managers to conduct system status checks and adjust operational parameters — from anywhere in the world.

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